

Name: _____

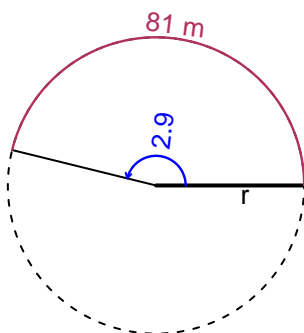
Date: _____

Trig Final (SLTN v663)

- You should have a calculator (like [Desmos](#)) and a [unit-circle](#) reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 2.9 radians. The arc length is 81 meters. How long is the radius in meters?

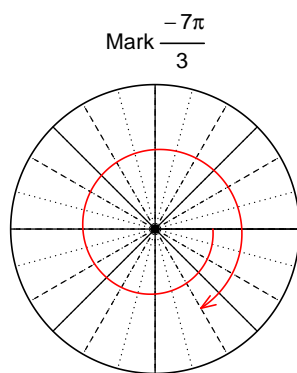


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$r = 27.93$ meters.

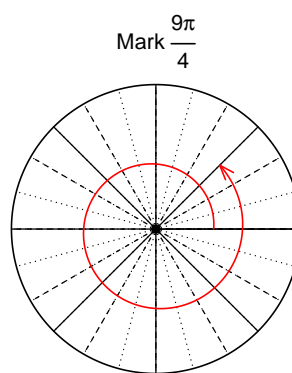
Question 2

Consider angles $-\frac{7\pi}{3}$ and $\frac{9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(-\frac{7\pi}{3}\right)$ and $\cos\left(\frac{9\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(-7\pi/3)$

$$\sin(-7\pi/3) = -\frac{\sqrt{3}}{2}$$



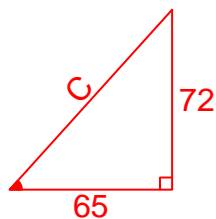
Find $\cos(9\pi/4)$

$$\cos(9\pi/4) = \frac{\sqrt{2}}{2}$$

Question 3

If $\tan(\theta) = \frac{-72}{65}$, and θ is in quadrant IV, determine an exact value for $\cos(\theta)$.

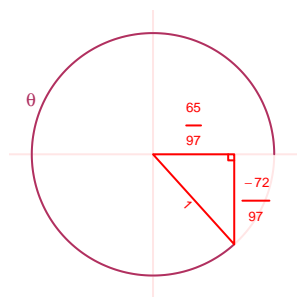
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}65^2 + 72^2 &= C^2 \\ C &= \sqrt{65^2 + 72^2} \\ C &= 97\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant IV in a unit circle.



$$\cos(\theta) = \frac{65}{97}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = 7.85$ meters, a frequency of 2.34 Hz, and an amplitude of 6.12 meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -6.12 \cos(2\pi 2.34t) + 7.85$$

or

$$y = -6.12 \cos(4.68\pi t) + 7.85$$

or

$$y = -6.12 \cos(14.7t) + 7.85$$